REMARKS

Allowable Subject Matter

Applicants thank the examiner for the indication of allowable subject matter in claims 1-7, 11, 13, 22 and 27.

Claim Objections

Claims 2-7 and 13 stand objected to for incorrect dependencies. Claims 2-7 are amended to depend from claim 1 and claim 13 is corrected to depend from claim 9.

Claim Rejections - 35 USC § 112

Claim 26 stands rejected under 35 U.S.C. § 112 for insufficient antecedent basis for "secondary electrons." Claims 26 is amended to recite "auger electrons" in stead of "secondary electrons."

Claim Rejections - 35 USC § 102

Claims 20, 21, and 29 stand rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Pat. No. 5,872,358 to Todokoro et al. ("Todokoro")

The Examiner states that Todokoro teaches a "scanning electron microscope system including an energy analyzer (33 and 34), a primary beam column for forming a primary electron beam including an objective lens (8), and a secondary optical system for collecting secondary electrons (23) through the objective lens (8) without degrading the resolution of the primary beam . . ."

Applicants submit that Todokoro does not teach an energy analyzer. Reference number 33 and 34 refer to electron detectors that detect the total number of electrons and not electron energy analyzers that determine the energy of the electrons. As described in the Todokoro's "Background of the Invention" section, Todokoro detects the number of secondary electrons, that is, the intensity of the detected signal, and he does not analyze the energy of the secondary electrons. "[A] secondary signal is detected which is formed by secondary electrons or reflected electrons which are secondarily generated from the

sample by irradiation with the primary electron beam, and the intensity of the detected signal is made an input for the intensity modulation in a cathode ray tube (CRT) which is scanned synchronously with the scanning of the primary electron beam." Col. 1, lines 23-28 (*emphsis added*).

Todokoro refers to detectors 33 and 34 as detectors, not energy analyzers. "[U]pper detector 33 is provided above the upper scanning deflector 15, while a lower detector 34 is provided between the lower scanning deflector 16 and the acceleration tube 9." Col. 8, lines 22-25. Moreover, in FIG. 5, the secondary electrons collide with plates 29a or 29b (shown in more detail in FIG. 2) to generate additional electrons for detection by detectors 33 and 34. The electrons generated from the plates 29a and 29b would have different energies from the electrons generated directly from the sample under observation, so one would typically not analyze the energies of those tertiary electrons.

Claims 23 and 24 stand rejected under 35 U.S.C. § 102 as anticipated by U.S. Pat. No. 4,470,694 to Nishimura et al. ("Nishimura"). The Examiner states that Nishimura "teaches a method of determining the composition of a material comprising creating a beam of electrons (20), directing the electrons toward a specimen through an objective lens (5), directing through the objective lens (5) secondary electrons emitted by Auger processes, deflecting secondary electrons away from the path of the primary beam toward an energy analyzer and analyzing the secondary electrons (col. 5, line 1- col. 6, lines 56, col. 13, lines 23-39, and FIG. 1 and 2.)"

Nishimura teaches a method and apparatus for positron extinction analysis in which a positron beam irradiates a sample and the gamma rays produced are analyzed. Abstract. As describe in Nishimura's "Background of the Invention" section, the positrons interact with electrons in the sample and undergo pair extinction or annihilation, that is, both the positron and the electron in the sample are converted into gamma rays, which are detected to determine properties of the sample. Nishimura teaches the use of both a transmission electron microscope (TEM) structure and a scanning electron microscope structure as part of his positron extinction analysis system.

The apparatus of FIG. 1, shown schematically in FIG. 2, shows that positrons are generated at source 12, are focused by objective lens 5 onto sample 4, and gamma rays

generated by the annihilation of electrons and positrons are detected by detector 19. Nishimura also teach operating the apparatus of FIGS. 1 and 2 as a transmission electron microscope as shown in FIG. 21. A beam of electrons is directed to the sample 4, which is sufficiently thin to allow electrons to pass through it. Electrons from the primary beam that pass through the sample are projected by objective lens 5 (and other lens) onto a florescent screen 11 to form an image.

In a TEM as described by Nishimura, electrons do not pass through an objective lens toward a sample, and the electrons that are detected are not secondary electrons, but are primary electrons from the primary beam that has passed through the sample. As Nishimura explains: "When passing through the sample 4, the electron beam is subjected to scattering and diffraction in accordance with the texture inside the sample. Therefore, the section of the electron beam after passing through the sample exhibits the data on the texture of the sample n terms of beam density. . . . This electron beam 20 is expanded by use of objective 5, the intermediate lenses 5,6 and the projecting lens 8, 9, and the image if formed on fluorescent plate 11." Col. 5, lines 28-37.

Thus FIGS. 1 and 2 and their description of a transmission electron microscope, do not teach the claimed elements of "directing the beam of primary electrons toward the specimen surface through at least a portion of an objective lens that immerses the specimen in a magnetic field."

Nishimura shows in FIG. 23 and described a positron annihilation detection apparatus that uses a scanning electron microscope. The scanning electron microscope in FIG. 23 includes a secondary electron detector 51 positioned on the side of the primary beam to collect electrons before they reach objective lens 48. Thus Nishimura does not teach the claim element of "directing through the objective lens secondary electrons emitted by Auger processes from atoms of the specimen."

Nishimura does not teach collection of any secondary electrons through the objective lens of an electron microscope in either the SEM or the TEM embodiment. Applicants request, therefore that the rejection of claim 23 and 24 be withdrawn.

Claim Rejections - 35 USC § 103

Claims 8, 9, and 14 stand rejected under 35 U.S.C. § 103 for obviousness over U.S. Pat. No. 4,470,694 to Nishimura et al. ("Nishimura"). The examiner states that Nishimura "teaches a scanning electron microscope system including a primary electron beam (20) column for scanning the beam across a specimen including Auger electron (col. 13, lines 23-39)." The examiner also states "FIG. 1 clearly depicts the path of secondary electrons through the objective lens. 694 depicts an analyzer (19) that can analyze Auger electrons (col. 6, lines 41-48)

As described above, Nishimura teaches in FIG. 1 a transmission electron microscope that detects primary beam electrons, not secondary electrons, after they pass through the sample; the TEM does not collect secondary electrons. The SEM of FIG. 23 uses a side-mounted electron detector 51 that does not use through-the-lens detection.

Regarding detector 19, it is a extinction γ-ray measuring apparatus "to detect and count the extinction γ-ray that are generated when the positrons undergo extinction inside the sample." Col. 6, lines 44-46. Thus, detector 19 detects gamma rays, and Nishimura does not teach an Auger electron detector.

Auger electrons are mentioned in col. 13, along with "characteristic x-rays, phosphorescence, and the like," as by products of the irradiation of a surface with an electron beam, but Nishimura does not teach and is not suitable for Auger electron analysis, any more that he teaches detecting characteristic x-rays or phosphorescence. Thus, Nishimura does not teach "a secondary electron optical system for collecting the Auger electrons through the objective lens" as recited in claim 8, and applicants respectfully request that the rejection be withdrawn.

Regarding claim 9, the examiner states that Nishimura teaches a shield 78 that shields the primary beam from the field. Claim 9 recites that the "deflector produces a field for deflecting Auger electrons and further comprising a shield that shields the primary beam from the field." As shown in Nishimura's FIG. 15, electrons are detected by detector 51 and electrons are not collected through the objective lens. The shield 78 is a magnetic shield "to cut off any detrimental magnetic field from outside" and does not shield the primary beam from a field for deflecting Auger electrons.

Claims 10 and 25 stand rejected under 35 U.S.C. § 103 for obviousness over Nishimura in view of U.S. Pat. No. 5,847,399 to Schmitt et al. ("Schmitt").

Regarding claims 10 and 25, applicants submit that claim 10 is patentable for the reasons described above with respect to claim 9, from which claim 10 originally depended. Neither Nishimura nor Schmitt teaches collection of Auger electrons through an objective lens. While Schmitt does use through-the-lens detection, Schmitt does not include an energy analyzer or mention Auger electrons.

Schmitt describes a magnetic deflector 60 to deflect the primary beam and a shield 61 to avoid eddy currents that surround the magnetic deflector 60. Abstract. Claim 25 recites a shield having a resistive outer surface "charged to create an external electric field related to the electric field of the electrostatic deflector." Schmitt does not teach an electrostatic deflector for deflecting secondary electrons from the path of the primary beam and does not teach a shield for protecting the primary beam from the electrostatic field of an electrostatic deflector. Schmitt teaches a magnetic deflector for deflecting the primary beam, and a shield that protects the primary beam from eddy current produced by the magnetic deflector. Because his purpose is different from that of the applicants, Schmitt does not teach the conductive/resistive shield construction recited in claims 10 and 25. Schmitt teaches a shield is made "of at least one soft magnetic layer 61a and an electrically insulating layer 61b." Col. 3, lines 35-36. The is no suggestion in the cited art to modify the structure and purpose of Schmitt's field for use in an Auger electron analyzer system.

Claims 12, 15-19 26, and 28 stand rejected under 35 U.S.C. § 103 for obviousness over Nishimura in view of various secondary references. Applicants submit that these claims are patentable for the reasons cited above with regard to their parent claims or because they contain limitations similar to those described above as being absent from the cited references. As described above, Nishimura does not teach collection of Auger electrons through the lens of an electron microscope, and therefore the various combinations of references do not teach the claimed invention.

Applicants respectfully request, therefore, that the application be reconsidered and that the case be allowed

Respectfully submitted,

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By: _____

Michael O. Scheinberg
Patent Reg. 36,919
P.O. Box 164140
Austin, Texas 78716-4140
Telephone: (512) 328-9510
Facsimile: (512) 306-1963